

## ABSTRACT OF THE DISCLOSURE

This invention describes an approach for monolithically integrating all the components of a photoreceiver—optical amplifier, optical band-pass filter, and photodiode module—on a single chip. The photoreceiver array employs unique optical amplifier and conversion technologies that provides the ultra-sensitivity required for free space optical communications networks. As an example, by monolithically integrating a vertical cavity surface emitting laser-diode (VCSEL) optical preamplifier with a photodiode receiver and related amplifiers and filters on the same chip, sensitivities as low as  $-47$  dBm (62 photons/bit at 2.5 Gb/s), along with an order of magnitude reduction in size, weight, and power consumption over comparable commercial-off-the-shelf (COTS) components can be demonstrated. In accordance with another aspect of the present invention, the concept of monolithic integration of optical amplifier with photodetector is extended to lasers, another amplifier and modulators covering ultra violet to very long wavelength infrared using the InP, GaAs, GaSb, InAs, InSb, SiGe, SiC and GaN etc based technologies.

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